

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of : Attorney Docket No. 2006_0784A
Yoshihito KAWAMURA et al. : **Confirmation No. 1946**
Serial No. 10/580,236 : Group Art Unit 1793
Filed May 23, 2006 : Examiner Sikyin Ip
HIGH STRENGTH AND HIGH : **Mail Stop: AMENDMENT**
TOUGHNESS MAGNESIUM ALLOY AND
METHOD OF PRODUCING THE SAME

DECLARATION UNDER 37 CFR 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Yoshihito Kawamura, the undersigned, a citizen of Japan, residing at Kumamoto-shi, Japan, do hereby declare that:

1. I am a co-inventor of the above-identified application.
2. I am being compensated for my work related to the above-identified application.
3. I have reviewed the above-identified application, the Office Actions and the references cited therein.
4. I have, under my control and direction, conducted the following experiments.
The particulars and results of the experiments are described below.

EXPERIMENTS

The difference between a crystal grain size of a rapidly solidified magnesium alloy and the crystal grain size of the magnesium alloy casting product of the present application can be seen from the following examples and figures.

Example 1 (comparative)

Example 1 is based upon a rapidly solidified magnesium alloy disclosed in the Abe et al. reference. The method of manufacture of the rapidly solidified $\text{Mg}_{97\%}\text{Zn}_{1\%}\text{Y}_{2\%}$ alloy of the comparative Example 1 is as follows: $\text{Mg}_{97\%}\text{Zn}_{1\%}\text{Y}_{2\%}$ alloys were prepared by induction melting in an argon atmosphere. The compositions were nominally expressed in atomic percentage. The rapidly solidified $\text{Mg}_{97\%}\text{Zn}_{1\%}\text{Y}_{2\%}$ ribbons were prepared by a single roller melt-spinning method in an argon atmosphere. The cooling rate of $\text{Mg}_{97\%}\text{Zn}_{1\%}\text{Y}_{2\%}$ ribbons were 400,000 kelvin/second.

Fig. 1 shows a TEM (Transmission Electron Microscope) image of the rapidly solidified ribbon-consolidated $\text{Mg}_{97\%}\text{Zn}_{1\%}\text{Y}_{2\%}$ alloy of Example 1. The average crystal grain size of the rapidly solidified $\text{Mg}_{97\%}\text{Zn}_{1\%}\text{Y}_{2\%}$ alloy is about 300 nm (0.3 μm).



Fig. 1

The crystal structure of the rapidly solidified magnesium alloy of the Abe et al. reference has a submicron crystal grain size, and does not have a crystal grain that is significantly larger in size as compared with the submicron size crystal grain.

Example 2

On the other hand, Example 2 is a high strength and high toughness magnesium alloy casting product, as in the present application. The method of manufacture of the casting product is as follows: $\text{Mg}_{97\%}\text{Zn}_{1\%}\text{Y}_{2\%}$ alloys were prepared by induction melting in an argon atmosphere. The compositions were nominally expressed in atomic percentage. The $\text{Mg}_{97\%}\text{Zn}_{1\%}\text{Y}_{2\%}$ alloy casting product was prepared by a gravity casting method that used an iron mold in an argon atmosphere.

Fig. 2 shows an OM (Optical Microscope) image of the $\text{Mg}_{97\%}\text{Zn}_{1\%}\text{Y}_{2\%}$ alloy casting product of Example 2. The average crystal grain size of the $\text{Mg}_{97\%}\text{Zn}_{1\%}\text{Y}_{2\%}$ alloy casting product is about **400 μm** .

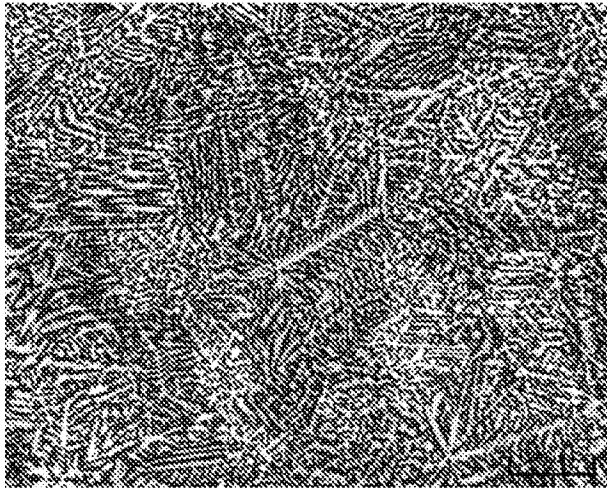


Fig. 2

As can be seen above, the crystal structure of the magnesium alloy casting product of the present application has a much larger crystal grain size (400 μm) as compared with the submicron size crystal of the comparative Example 1 (0.3 μm).

Example 3

Example 3 is a high strength and high toughness magnesium alloy comprising a plastically worked product which is produced by preparing the magnesium alloy casting product of the present application. The method of manufacture of the extruded $\text{Mg}_{97\%}\text{Zn}_{1\%}\text{Y}_{2\%}$ alloy is as follows: the casting product of Example 2 was extruded at a condition of a temperature of 350°C and an extrusion rate of 10.

Fig. 3 shows an OM image of the extruded $\text{Mg}_{97\%}\text{Zn}_{1\%}\text{Y}_{2\%}$ alloy of Example 3. The average crystal grain size of the recrystallization region of the extruded $\text{Mg}_{97\%}\text{Zn}_{1\%}\text{Y}_{2\%}$ alloy is about $4\text{ }\mu\text{m}$.

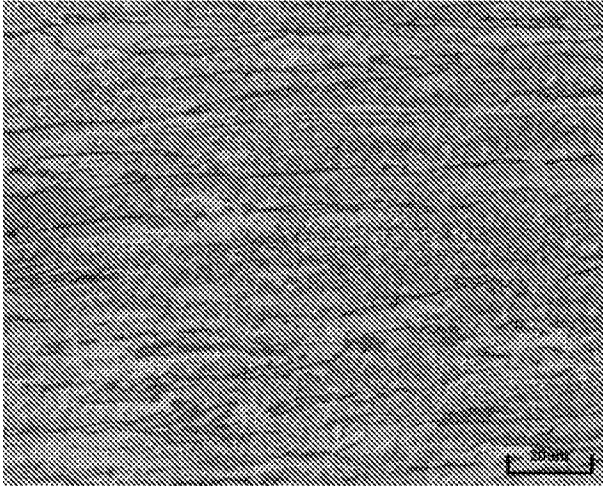


Fig. 3

As can be seen from the comparison of Figs. 1-3, the crystal structure of the rapidly solidified magnesium alloy of the Abe et al. reference (Example 1) has a submicron crystal grain size, and does not have a crystal grain that is significantly larger in size as compared with the submicron size crystal grain in Examples 2 and 3, which correspond with the present application.

Therefore, the Abe et al. reference does not disclose or suggest a hcp structured magnesium phase having an average particle size of $2\text{ }\mu\text{m}$ or more, and does not disclose or suggest a long period stacking ordered structure phase having at least single-digit smaller dislocation density than the hcp structured magnesium phase, as in the present application.

I further declare that all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

June 30, 2010
Date

Yoshihito Kawamura
[Declarant's Name]